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# ONTARIO WATER RESOURCES COMMISSION

## WATER RESOURCES SURVEY

## COUNTY OF CARLETON

A SURVEY OF
INDUSTRIAL WATER USE AND
WASTE DISPOSAL

PART 2

1960 to 1963

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# WATER RESOURCES SURVEY

## County of Carleton

A survey of
industrial water use and
waste disposal

## PART II

Date
1960 to 1963

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## INTRODUCTION

During August and September in 1960 and in July 1963, the Industrial Wastes Branch of the Ontario Water Resources Commission investigated the industrial water use in Carleton County. This report is a summary of those investigations.

The purpose was to determine the quantity and source of water used by the industries in Carleton County, and also the quantity and characteristics of the wastes from these industries.

Industrial investigations were carried out at the same time as other Divisions and Branches of the Ontario Water Resources Commission inspected public and private water and sewerage systems as well as the quantity and quality of surface waters and ground waters throughout the County.

## SUMMARY

Industry in Carleton County is concentrated in the Ottawa area. The areas investigated were the City of Ottawa, the Town of Eastview and industries in Nepean Township. Industry is diversified and supporting in nature to the pulp and paper industry and to the operations of the Federal Government.

The presence of one large industry with a very large water consumption makes it necessary to consider this industry separately from the municipalities.

The total industrial water consumption for Carleton County was estimated at seven million gallons per day. This was obtained directly from the Ottawa River (5.5 MGPD), from municipal water supplies (1.5 MGPD) and a small amount from private wells (50,000 GPD). The following table summarizes the industrial consumption. All values are Imperial gallons per day.

|  | E.B. Eddy | Ottawa | Eastview | Nepean Township | Total |
|---|---|---|---|---|---|
| Water Consumption |  |  |  |  |  |
| Estimated total consumption | 5,460,000 | 1,352,000 | 60,000 | 37,000 | 6,909,000 |
| Accounted for by industrial visits | 5,460,000 | 1,240,000 | 36,500 | 37,000 | 6,773,500 |
| From municipal supply | --- | 1,340,000 | 60,000 | --- | 1,400,000 |
| From private wells | --- | 12,000 | --- | 37,000 | 49,000 |
| From Ottawa River | 5,460,000 | --- | --- | --- | 5,460,000 |
| Wastes Discharged |  |  |  |  |  |
| To Watercourses | 5,460,000 | 10,000 | --- | 2,000 | 5,472,000 |
| To Sewerage Systems | --- | 1,342,000 | 60,000 | 35,000 | 1,437,000 |

The preceding table also summarizes the industrial discharges. Of the total seven million gallons discharged daily, 5-1/2 million gallons are directed to natural watercourses and the remaining 1-1/2 million are discharged to municipal sewerage systems.

The industrial investigation of Carleton County revealed two industries using large volumes of water. These two industries account for ninety per cent of the industrial water used in Carleton County. The two industries are The E.B. Eddy Company and the O'Keefe Brewing Company Limited, both of which are in the City of Ottawa.

The volume of waste from the E.B. Eddy Company make it necessary to exclude these wastes from the municipal sewerage system. It is suggested that this company continue to discharge its wastes to the Ottawa River, and endeavour to decrease the concentration of waste constituents to meet the requirements of the Ontario Water Resources Commission.

The O'Keefe Brewing Company Limited discharges wastes having a high organic content. However, because of the absence of other strong wastes in the City of Ottawa, the pretreated brewery wastes should cause no problems at the municipal sewage treatment plant due to the high dilution factor.

The Dustbane Manufacturing Company in the City of Ottawa is discharging wastes to a watercourse and storm sewer. This plant should apply to the City of Ottawa for acceptance of this waste into the municipal sanitary sewage system.

The remaining industries in Carleton County were found to have satisfactory disposal facilities.

## HISTORY

Because of the location on the Ottawa River at the junction of the Gatineau River, the Ottawa area is suited for basic industry dependent on forest products. The rivers are suitable for transportation and inexpensive hydro-electric power is available.

As early as 1800 a lumber industry was started in this area. A few years later, 1850, Mr. E. B. Eddy began producing matches and then expanded into the pulp and paper industry until now this is the major industry in the area. After the pulp and paper industry was established, service industries producing equipment for pulp and paper mills moved into the area.

With the founding of the National Capital in Ottawa, industrial expansion has not been emphasized. Considering the size and population of the City of Ottawa, it is not a highly industrialized city. Since Ottawa is the Dominion Capital, much of the city's industry services the Dominion Government in such fields as the printing of securities and office forms.

## CONDUCTING THE SURVEY

A partial list of the industries in Carleton County was obtained from the Eastern Ontario Development Association. This list was supplemented in various ways until a fairly comprehensive list was compiled. Industrial water consumption figures were obtained from the City of Ottawa, the Town of Eastview and from individual industries. From the above information, a cross-section of the industry was selected for investigation along with any industries, either known or suspected of discharging industrial waste. Industries with large water consumptions were also visited. The above mentioned lists are not included in this report, but the industries that were investigated are in Appendix I.

The industrial investigations consisted of visiting the industry, interviewing a member of management of the firm, inspecting processes that discharge industrial waste waters, and where necessary, estimating flows and obtaining samples of waste discharges. Individual reports on each industry visited are included in Appendix I under the municipality in which the industry is located.

The major portion of the field investigations were carried out during August and September, 1960. During July 1963 industries were revisited, and water consumption data was brought up to date.

All samples of raw water or waste effluent were returned to the Ontario Water Resources Commission Laboratory in Toronto where the analyses were performed in accordance with the "Standard Methods for the Examination of Water and Wastewater, Eleventh Edition." Appendix II of this report contains a brief discussion on each of the analyses. Appendix III lists the normal constituents of sanitary sewage, and also suggested limits for the discharge of waste water to a natural watercourse or storm sewer. These two appendices are offered as an aid in interpreting the analytical results in this report.

## CITY OF OTTAWA

Of the one hundred odd industries in the City of Ottawa, 26 industries were investigated. These 26 industries accounted for over 90 per cent of the industrial water obtained from the municipal supply, and 98 per cent of the total industrial consumption. Only three industries were found that used water from sources other than the municipal supply. One industry used water directly from the Ottawa River and two others had private wells. The source of the industrial water was as follows:

| | | |
|---|---|---|
| from the Ottawa River | - | 5,460,000 |
| from the municipal supply | - | 1,340,000 |
| from private wells | - | 12,000 |
| Total | - | 6,812,000 gallons per day |

Two industries discharged wastes to surface waters, and all other industrial wastes were discharged to the municipal sanitary sewage system.

| | | |
|---|---|---|
| discharged to surface water | - | 5,470,000 |
| discharged to sewerage system | - | 1,342,000 |
| Total | - | 6,812,000 gallons per day. |

During the 1960 investigation, it was estimated that 20 per cent of industrial waste water discharged to the municipal sewers was uncontaminated cooling water, and during the 1963 survey this was estimated at just over 10 per cent. The reduction was due mainly to the recirculation of cooling water at the publishing companies.

The industrial waste survey in the City of Ottawa indicated that little or no problem should arise in a municipal treatment plant because of excessive strength, toxic chemicals, or the presence of acids or alkalies. The diversity of industry, with no single dominant industry likely to cause a concentration build-up of a particular industrial waste, would assist in preventing interference at a municipal sewage treatment plant.

The survey revealed that one industry, only because of its large volume of waste, would present a problem if allowed to discharge its waste to the municipal system. This was the Ottawa Mills of the E. B. Eddy Company which discharged 5.5 million gallons per day of waste waters to the Ottawa River.

The O'Keefe Brewing Co. Ltd. was found to have a waste of considerably higher organic strength than normal sanitary sewage. However, the dilution received in the sewers was considered sufficient to reduce the deleterious effect which could result at a municipal sewage treatment plant.

One other industry, Dustbane Manufacturing Company discharged wastes to a ditch and storm sewer, which drained to the Rideau River.

## Recommendations

The E. B. Eddy Company should continue to discharge its industrial waste water to the Ottawa River, and continue to improve the quality of the waste effluent with the view of ultimately producing an effluent within the objectives of the Ontario Water Resources Commission.

Should the City of Ottawa build a secondary sewage treatment plant, arrangements should be made to handle the wastes from the O'Keefe Brewing Company Limited. The sewage treatment plant should provide the capacity to accept the wastes as they presently are, or the brewery should provide pretreatment to reduce its waste strength.

The industrial wastes from Dustbane Manufacturing Company should not be discharged to a surface water. The company should apply to the City of Ottawa to have the wastes accepted into the city sanitary sewerage system.

## TOWN OF EASTVIEW

Six of the twelve industries in the Town of Eastview were investigated, and were found to consume over 60 per cent of the total industrial water consumption for the town. The total consumption was estimated at 60,000 gallons per day. The investigations also revealed that over 50 per cent of the water consumption was discharged as uncontaminated cooling water.

All the industries used water only from the municipal supply and discharged all wastes to the municipal sewerage system. The only exception was Allied Paper Products Limited and Capital Carbon and Ribbon Company Limited, who together discharged a total of 10,000 gallons of cooling water each two months to a roadside ditch.

The second largest water consumer (18,000 gallons per day), and the only plant that discharged wastes of any consequence, was destroyed by fire after the 1960 survey. This was the Capital Meat Company Limited.

### Conclusions

No industries were found in the Town of Eastview that discharged wastes that could have a detrimental effect on the operation of a sewage treatment plant.

Wherever possible uncontaminated cooling water should be discharged to storm sewers or natural watercourses. This will reduce the hydraulic loading in the sewerage system.

## NEPEAN TOWNSHIP

During the 1960 survey, three industries in Bells Corners, Computing Devices of Canada Limited, Northern Electric Company Limited and McGlashan Silverware Limited were visited. Late in 1960 McGlashan Silverware Limited closed down its operations, and in 1961 Northern Electric Company Limited moved to its new quarters at Crystal Bay.

Since there is presently no municipal water supply available for these industries, they obtain water from private wells. Together they use 37,000 gallons per day.

All wastes from Northern Electric Company Limited are pumped to a township sewer to the Nepean Township sewage treatment plant. Computing Devices of Canada Limited discharge a small amount of industrial waste to the Ottawa River, and discharge sanitary wastes to septic tanks equipped with tile beds and to the Nepean sewage treatment plant.

The two industries have made satisfactory arrangements for the discharge of their wastes. The wastes being discharged to the Ottawa River are acceptable for such, and the wastes being discharged to the Nepean sewage treatment plant have resulted in no complaints concerning the operation of the sewage plant.

## APPENDIX I - (a)

## INDIVIDUAL INDUSTRIAL REPORTS FOR THE CITY OF OTTAWA

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## ATOMIC ENERGY OF CANADA LIMITED

Commercial Products Division,
Tunney's Pasture, Ottawa

The Commercial Products Division of the Atomic Energy of Canada employing 150 people is sponsored by the Federal Government to produce radio isotopes. These are available to industry along with technical assistance and advice for commercial use. Experimental work is carried out by the division to further the use of radio isotopes, etc. The operating schedule is five days per week, one shift per day. The personnel interviewed were Mr. Norman Delahunty, Health Hygiene Officer and Mr. Mark Chenier, Maintenance Superintendent.

All water used in the building was municipal and the amount consumed was unavailable since it represented a small part of that used by a complex of government administrative offices in the area of Tunney's Pasture.

There were no industrial liquid wastes produced from the operations of the Commercial Products Division although safeguards were employed to prevent accidental discharge of radio active material. Water emanating from the active area discharged to a reservoir. A monitoring system then determined the absence of radio activity before release of the water to the city sewers.

## BEACH FOUNDRY LIMITED

This plant produces gas and electric stoves, water heaters and hot air furnaces at 75 Spencer Street. The plant employs 160 people. The water used by the plant is obtained from the municipal supply and amounts to 55,600 gallons per day.

The plant operates five days per week mainly one shift per day with some operations continuing three shifts per day.

Mr. R. S. Van Wort, the Plant Manager was interviewed.

Before the product components were painted or enamelled, they were pickled. The pickling procedure was as follows: an alkali degreasing dip, a hot water overflowing rinse, a sulphuric acid dip, a cold water overflowing rinse and a neutralizing dip. If the part was to be painted, it was also given a $FeSO_4$ bonderizing dip. The continuous waste from the pickling section was estimated at five gallons per minute and the intermittent wastes were as follows:

- 500 gallons daily of a 50-50 borax-soda neutralizing solution
- 400 gallons every two months of the sulphuric acid solution

Painting of the parts was a dip process producing no liquid waste. The only waste from the enamelling process was water vapour formed in drying the enamel before baking. Cooling water used on the electric furnace, welding machines and a compressor was recirculated through a tank of approximately 100,000 gallon capacity. The overflow from this tank was used for sanitary purposes, and the remaining overflow was sewered.

Grab samples of the sewered recycle water and the pickling section were taken and sent to the OWRC Laboratory in Toronto for analysis. The analytical results are listed below.

With the exception of pH the following results are quoted in parts per million.

| | | Pickling Room Effluent | Recirculated Water Overflow |
|---|---|---|---|
| Solids - | total | 386 | 100 |
| | suspended | 50 | 26 |
| | dissolved | 336 | 74 |
| pH | | 4.9 | 7.8 |
| Acidity | | 68 | 24 |
| Iron | | 40 | trace |
| Total Chromium | | 0.0 | 0.0 |

From the analysis it is seen that iron is the only constituent of the waste that need to be discussed. The pickling room effluent comprised roughly 1/7 of the total plant effluent, and thus the total effluent would be 6 ppm iron which is well below the limit recommended for the discharge of iron to municipal sewers.

## BRITISH AMERICAN BANK NOTE COMPANY LIMITED

A plant employing 225 people is operated at 975 Gladstone Avenue for the security printing of bank notes, bonds, excise stamps and cheques. The plant uses an average of 18,600 gallons of water per day, which is obtained from the City of Ottawa. This increases to 24,000 GPD during the summer when more cooling water is required.

Mr. K. S. Sargent the Assistant General Manager was interviewed.

The plant operated five days per week and one shift per day.

### PLANT OPERATIONS

Cooling water used in the jackets of the ink mills, the cooling coils of the plating tanks, air conditioning equipment (year round) and humidifying equipment (in winter) is recirculated through a cooling tower.

The plant has a small nickel and chrome plating operation where printing plates are plated. The five or six spray rinses per day, involved in the plating operations, go directly to the plant sewer. The caustic stripper used for removal of chromium prior to replating, contains six ounces per gallon of caustic soda, and 100 gallons is dumped every two to three months by pumping it out through a water aspirator insuring adequate dilution. In addition to the plating operation, a small silvering operation takes place, silvering about two printing plates per week.

Printing plates and rolls are hardened by immersing them in molten potassium cyanide, quenching in oil and in brine and then rinsing them. This is a small degreasing operation. The sludge and skimmings from the cyanide pots are land dumped. The pots have about 100 hours life and when due for a change, they have about 25% of the potassium cyanide left. Sometimes both pots and contents are discarded to the land dump and sometimes the contents are rinsed to the sewers.

## CONCLUSION

The quantities of wastes from the rinses of various small plating and hardening operations were insignificant in respect to chemical contamination of the plant effluent, and were heavily diluted with cooling water from the ink mill, moulding presses and air conditioning. The majority of the waste water from this plant was uncontaminated cooling water.

## CAMPBELL STEEL AND IRON WORKS LIMITED

This plant at 855 Carling Ave. employs 32 people to fabricate and repair boilers. The plant uses 4500 gallons of city water per day and pumps 2100 gallons per day cooling water from a private well.

Mr. Plunkett was interviewed and revealed that the plant operated five and one-half days per week, one shift per day.

The operations in the plant are dry machining, forming and assembling of boilers. Water is used to pressure test the boilers, and following the test the water is sewered. Cooling water used on a compressor is pumped from their own well at about five gallons per minute for seven hours per day, and discharged to the city sewer.

No contaminated industrial waste leaves this plant. The waste that is discharged is uncontaminated cooling and testing water.

## CANADIAN AERO SERVICE LIMITED

This is a drafting office located at 348 Queen St., and employs twenty-four people. The company is a sales office for three-dimensional relief maps. Their water service is included with Spartan Air Services and is only for sanitary purposes. (approximately 500 gallons per day).

## CANADIAN BANK NOTE COMPANY LIMITED

This plant is engaged in the security printing of bank notes, postage stamps and bonds with 350 employees. The company, located at 145 Richmond Rd., uses 25,900 gallons per day of city water. The water consumption varies between 20,000 and 40,000 gallons per day depending on the cooling water requirements.

The plant operates five days per week, one shift per day. Mr. K. E. Eastman is the Assistant Plant Manager.

### PLANT OPERATIONS

Cooling water used in the jackets of the ink mills, in air conditioning and humidifying equipment is not recycled.

Small chrome plating and cyanide hardening operations are carried out on about five printing plates per week. The plating wastes are the rinses following a degreasing dip and following plating. The hardening is carried out by dipping the printing plate in molten sodium cyanide and then quenching the plate in a water cooled oil bath. The wastes from the hardening operation are the rinse following the oil quench, and the sludge from the cyanide pots which is land dumped.

In the production of lithographic printing plates a small amount of spent hypo, fixer and developer amounting to two or three gallons per week, is sewered.

### SAMPLING

A grab sample of the total plant effluent was taken from the plant sewer before it reached the city sewer on Patricia Street.

## Canadian Bank Note Company Limited

With the exception of pH the following results are in parts per million.

| | | |
|---|---|---|
| 5-day B.O.D. | | 16 |
| Solids | - total | 144 |
| | - suspended | 14 |
| | - dissolved | 130 |
| pH | | 6.7 |
| Alkalinity | | 36 |
| Chromium | | 0.5 |
| Cyanide | | 0.0 |

## CONCLUSIONS

The waste from this plant can safely be discharged to the sanitary sewer. The waste contains a large proportion of cooling water.

## CAPITAL WIRE CLOTH AND MANUFACTURING COMPANY LIMITED

The company employs 150 people and operates on Hinton Ave. The plant water consumption is 17,400 gallons per day, and this water is obtained from the municipal supply.

At this plant, brass, bronze and copper wire is woven into wire cloth, which is used as the travelling wire on Fourdrinier paper machines. The weaving and soldering operations are dry processes. Thus, the only industrial waste water discharged from the plant is uncontaminated cooling water. The waste waters are being discharged to the city sewer.

Mr. E. Sandulo, Assistant to the Production Superintendent was interviewed. The plant operated five days per week and three shifts per day.

# CITIZEN PUBLISHING COMPANY

The Citizen Publishing Company is housed in a building at 136 Sparks Street. The building has 450 employees in it, including publishing personnel and other tenants. The total water consumption in the building is 7,100 gallons of city water per day. The product of the Citizen Publishing Company is the Ottawa Citizen.

## PLANT OPERATIONS

The industrial waste from the building is cooling water used on linotype and stereotype machines and in air conditioning equipment. The building water consumption was 40,000 gallons per day of which a large portion was used for cooling purposes. The plant installed a recirculation system for the cooling water, and reduced the water consumption to 7,100 gallons per day.

## CONCLUSION

No industrial waste is discharged to the city sewer, thus the liquid wastes other than sanitary are uncontaminated cooling waters.

## COCA COLA LIMITED

There are two soft drink plants in Ottawa. One produces Coca-Cola and the other Pepsi-Cola. Both of these plants are in the process of moving to new buildings. The water consumption at the old plants varied depending on production as follows:

| | | |
|---|---|---|
| Coca-Cola | - | 85,000 to 175,000 GPD |
| Pepsi-Cola | - | 40,000 to 70,000 GPD |

Wastes from these plants is equipment wash water mainly from the bottling machines.

## R. L. CRAIN LIMITED

R. L. Crain Limited operates a plant at 190 Richmond Rd., where business forms are printed and business systems are assembled and serviced. The plant has 400 employees and a daily water consumption of 35,600 gallons of city water. The plant also pumps 9600 gallons per day cooling water from a private well and discharges it to the city sewer.

The plant operates five days per week, one shift per day.

### PLANT OPERATION

Cooling water pumped from a private well is used to cool the prestone coolant on a compressor. The pump on this well has a capacity of 130 gallons per minute but operates at 10 gallons per minute for 16 hours per day, and five days per week. City water is used to cool a vapour degreaser. In the production of offset printing plates about ten ounces of spent photographic solutions are sewered each day with wash water that flows at five gallons per minute. Waste from a blue print machine is land dumped.

### SAMPLING

A grab sample of the total plant effluent was taken from a manhole in the plant sewer before it reached the city sewer on Richmond Rd. The analytical results are included here. With the exception of pH all values are in parts per million.

| | | |
|---|---|---|
| 5-Day B.O.D. | | 17 |
| Solids | - total | 222 |
| | - suspended | 44 |
| | - dissolved | 178 |
| pH | | 8.4 |
| Alkalinity | | 150 |

## R. L. Crain Limited

| | |
|---|---|
| Chrome | 0.0 |
| Cyanide | 0.0 |

## CONCLUSION

A large part of the industrial waste from this plant is uncontaminated cooling water, the remainder of the waste if discharged to a municipal sewerage system would cause no problem at a sewage treatment plant.

## CRAWLEY FILMS LIMITED

Crawley Films employ about 80 persons for the production, filming and development of motion and still pictures for government and industry. A large building was employed at 19 Fairmont Ave. for this purpose and was devoted mostly to administrative offices and studio space. Process operations were on a small scale. Mr. R. Sparks, the Chief Engineer was interviewed and indicated the source of flow to the sewers.

The total water consumption was 1,523,184 gallons per year or based on a 300 working day year would be approximately 5,000 gallons per day. The only use of water other than for domestic purposes including air conditioning was a filtered rinse water on a photographic developing machine. About 30 pounds of photographic chemicals (developer, stop-bath-fixer) were used per week, and a small amount of these spent chemicals not taken out of solution during manufacture of a motion picture film, was carried away in the rinse water. The quantity of rinse water was estimated by Mr. Sparks to be three gallons per minute at a temperature of 70°F and the amount of contamination by spent chemicals was assumed to be insignificant.

A single outfall carried all waste flow, including roof drainage, boiler water, domestic, air conditioning and process rinse water to the sanitary sewer on Fairmont Street. The waste from this plant would not be harmful to a sewage treatment plant.

## DUSTBANE MANUFACTURING COMPANY LIMITED

The Dustbane Manufacturing Company was located in a recently established industrial zone at 1334 Avenue K.

A total of 70 people were employed including 15 office staff, eight hours per day, five days per week, with little or no seasonal variation.

Cleaning supplies were compounded from such raw materials as soaps, waxes, powdered soaps, cleaning agents, fatty acids, caustic potash and resins.

Mr. Don Redmond of the Quality Control Division was interviewed and provided a tour of the manufacturing areas.

Municipal water was consumed at a rate of 13,200 gallons per working day and the majority was used for production purposes, such as, wax cooling and for washing of Kettle tanks and other equipment. Cooling of wax was estimated to use 2500 gallons of water per day and a breakdown of the remaining quantities was unknown.

Sanitary wastes were sewered to a municipal sanitary sewer, and process wastes from the production department were discharged to a ditch and thence to the Rideau River through a small creek.

A sample of the waste effluent from the production department to the ditch was collected on August 31st, 1960.

| | |
|---|---|
| 5-Day B.O.D. | 195 ppm |
| Solids - Total | 280 ppm |
| - Suspended | 90 ppm |
| - Dissolved | 190 ppm |
| pH | 8.7 |
| Alkalinity | 70 ppm |

Dustbane Manufacturing Co. Ltd.

| | | | |
|---|---|---|---|
| Nitrogens | - Total Kjeldahl | 59.5 | ppm |
| | - Free Ammonia | 1.2 | ppm |
| | - Nitrite | 0 | ppm |
| | - Nitrate | 0 | ppm |
| Phenol | | 750 | ppb |
| Detergent (As Manoxol O.T.) | | 60 | ppb |

The above analyses indicated an effluent suitable for discharge to a sanitary sewer but unfit for discharge to a natural watercourse or storm sewer. The effluent should be diverted to the municipal sanitary sewer under approval by the City Engineering Department.

# THE E. B. EDDY COMPANY

## PERSONNEL INTERVIEWED

| | |
|---|---|
| Dr. W. Gallay | Director of Research |
| Mr. D.G. McCrone | Manager, Sulphite and Board Mills |
| Mr. D.D. Murison | Process Engineer, Technical Division |
| Mr. W.E. Pritchard | Supervisor, Production Reports and Statistics Department |
| Mr. E.C. Carey | Technical Control Chemist |

## GENERAL

The E.B. Eddy Company is situated in Hull, Quebec and Ottawa, Ontario. The mill actually spans the Ottawa River with some of the plant buildings on islands in the river.

On the Hull side is a sulphite pulp mill, a ground wood mill, several paper machines, a bleach plant, a water filtration and pumping plant and debarking equipment. The Ottawa mill consists of a board mill containing one cylinder machine and a paper mill containing three Fourdrinier machines. Barking and pulping operations are no longer carried out at the Ottawa mill.

In October of 1959, the Ottawa Valley Effluent Improvement Committee was formed with Dr. W. Gallay of The E. B. Eddy Company as its Chairman. The seven mills represented on this committee are, The E. B. Eddy Co., Canadian International Paper Co., Gatineau and Hawkesbury Mills, Thurso Pulp and Paper Co. Ltd., The James MacLaren Co. Ltd., J. C. Wilson Ltd. and the Rolland Paper Co. Ltd. This committee is a co-ordinated approach to the pollution problems of pulp and paper mill wastes in the Ottawa Valley.

The Ottawa Mill of The E. B. Eddy Company has 700 employees, and during the summer months when log handling operations are in progress, an extra 50 employees are needed.

## The E. B. Eddy Company

The Specialty Mill (paper mill) operates 24 hours per day, six days per week. The Board Mill operates 24 hours per day and six days per week.

## WATER CONSUMPTION

The Ottawa Mill has three sources of water; Ottawa City water, water screened and pumped by two pumps at the Ottawa Mill, and water from the Hull Mill filtration plant. The quantity obtained from each source was estimated by mill personnel from pump capacities, and from average monthly consumption records. The various quantities of water from the different sources, and the sewer flows are listed in the following table. Values for the August 1960 and the July 1963 surveys are both included. Increased Production in the Board Mill accounted for the increased water consumption. Figures are U.S. gallons per minute.

| | Specialty Mill | | Board Mill | |
|---|---|---|---|---|
| | 1960 | 1963 | 1960 | 1963 |
| Ottawa City Water | 20 | -- | 80 | -- |
| Hull Mill water | 1050 | 1120 | 370 | 400 |
| Ottawa Screened Water | 1460 | 1380 | 780 | 1650 |
| Total Consumption | 2530 | 2500 | 1230 | 2050 |
| Sewer Flow | 2530 | 2500 | 1230 | 2050 |

This table neglects evaporation losses and water in the finished product. The amount of water noted under Ottawa screened water was obtained by difference between the measured sewer flow and the metered water consumptions.

## The E. B. Eddy Company

### PRODUCTION

The Board Mill produces an average of 75 tons per day of finished product. This is the yearly average including down time. During 1960 the Board Mill did not operate continuously as it does now.

The three Fourdrinier machines have a capacity of 135 tons per day but the yearly average including down days was approximately 110 tons per day in 1960 and 127 tons per day in 1963. On the day of the investigation in 1960 the following products were being produced: on machine 9, Multicopy Duplicating, a medium filled paper; on machine 10, Cheneaux Bond which has a low filler content; on machine 11, Gard Coated Sheet which has a low sewer loss because the fillers and additives are coated on the sheet after the sheet is formed and not mixed with the pulp as on the other machines; and machine 12 (the board machine) was producing #1 Patent-Coated Manilla, which is the largest single product from the Board Mill. In 1963 machine 9 was producing a high filler content paper; machine 10, no filler; machine 11, a medium filled paper and machine 12 was producing #1 Patent-Coated News Back.

Since the amount of suspended solids in the mill effluent depends on which products are in production and how much filler is added to each, the products mentioned above should give an effluent which represents normal mill operation.

### RAW MATERIALS

The raw materials used in the Ottawa Specialty Mill are E. B. Eddy sulphite, bought sulphite and Kraft pulps, fillers, dyes, etc. The Board Mill uses E. B. Eddy sulphite and groundwood pulp and purchased Kraft pulp and waste paper.

## The E. B. Eddy Company

## PLANT OPERATION

### Specialty Mill

Each of the three paper machines has similar pulp preparation and white water systems. After repulping the pulp is pumped through the hydracycling tanks and the hydra refiners, where fillers are added and the fibrils are unravelled. The pulp is then dropped to the dump chest where more additives are mixed with the pulp, and than pumped to the machine chest, a constant level tank.

The pulp is then directed through a Jordan refiner, Bauer cleaners, and Jonsson screen to the head box of the paper machine.

The white water draining from the travelling wire is collected in the wire pit, dropped to the couch chest and pumped to the save-all unit. From the save-all the fibre and 85% of the white water is returned to the system and the remaining screened white water is sewered.

The pulp leaving the travelling wire contains 65% moisture and is dried to 6% by means of steam heated rolls which remove the water as a vapour.

### Board Mill

The Board Mill is equipped with a cylinder type machine having seven vacuum cylinders. Each of these cylinders applies a layer of pulp to a travelling felt. The pulp is dewatered by suction boxes between the cylinders before entering the drier section of the machine.

Since the paper board is faced with first grade pulp, backed with lesser grades and filled with repulped scrap paper, four separate pulp preparation systems, similar to those in the Specialty Mill, can be used in the seven sections of the board machine.

### The E. B. Eddy Company

White water from the vacuum cylinders is collected in three white water chests. When all the collected white water is not needed for make-up, the stream containing the least amount of fibre is sewered through an automatic level control valve.

## SOURCES OF WASTE

### Specialty Mill

The main waste is the white water overflow which amounts to 15% of the white water in the system. Before being sewered 98% of the fibre is recovered on a save-all unit. There is one vacuum save-all unit for each paper machine. The rejects from the tertiary Bauer cleaners and the Jonsson screens are sewered directly. Water removed from the pulp by the couch roll is also sewered directly. All the waste from the Specialty Mill is discharged to the Ottawa River through one sewer equipped with a Parshall flume and a continuous sampler.

### Board Mill

Again the main waste is the white water overflow. Also sewered is the water from the suction boxes between the cylinders of the board machine and rejects from screens and pulp cleaners. All these wastes are discharged through a Parshall flume and a continuous sampler to the Ottawa River.

### Debarking

In 1960, 185 tons of wood per day was debarked at the Ottawa Mill during the summer months. Now all debarking operations are carried out at the Hull mill.

Throughout the paper and board mills are compressors, vacuum pumps and motor bearings requiring cooling water which is discharged to the Paper Mill or Board Mill sewer.

## The E. B. Eddy Company

The above losses are those that occur in the continuous operation of the mill. In addition to these are losses that come from the Sabbath closing down of production and from changing to a lighter coloured or different grade of paper. In these operations the pulp preparation and white water handling equipment is dumped. The outlets from the various pulp chests are on the side of the chest about one foot from the bottom. Thus, when production is being closed down, one foot of stock is left in each chest which has to be sewered. A continuous refining process, installed after August 1960, reduced these losses, but did not eliminate these periodic discharges.

## SAMPLING

1960 - As well as samples of the total effluent from the Board Mill and the Specialty Mill, samples were taken throughout both mills. The vacuum box overflow, rejects from the tertiary Bauer cleaners and the save-all effluent were sampled in the Specialty Mill, and the lean white water overflow and the waste from the board machine were sampled in the Board Mill.

1963 - Samples were obtained from the company's composite samples of the total effluent from the Specialty and Board Mills.

## ANALYSIS

The samples were analysed for the following: solids, (total, suspended, dissolved, dried and ignited), pH, acidity, phenol equivalents, nitrogen (kjeldahl, ammonia, nitrite and nitrate) and 5-Day Biochemical Oxygen Demand.

## SEWER FLOWS AND LOSSES

The following table contains average sewer flows and sewer losses made available to the survey party from the Ottawa Mill records.

The E. B. Eddy Company

| | Specialty Mill | | Board Mill | |
|---|---|---|---|---|
| | 1960 | 1963 | 1960 | 1963 |
| Flow - U.S. gpm | 2530 | 2500 | 1230 | 2050 |
| Losses - tons per day | 6.7 | 6.6 | 5.0 | 3.0 |

On the day of the investigation in 1960 the white water on machine #9 became contaminated with Kraft pulp containing a water proof coating and the whole machine had to be dumped and cleaned. This increased the sewer loss from 2.2 tons per eight hours to 5.6 tons per eight hours, according to mill records.

From samples and flow rates obtained on the day of the investigations, the following sewer losses were calculated in tons per day.

| | Specialty Mill | | Board Mill | |
|---|---|---|---|---|
| | Suspended Solids | Volatile Suspended Solids | Suspended Solids | Volatile Suspended Solids |
| 1960 | | | | |
| grab sample | 5.2 | 2.1 | 2.7 | 1.6 |
| composite sample | 21.3 | 15.0 | 2.6 | 1.8 |
| 1963 | | | | |
| composite sample | 6.4 | 2.6 | 3.9 | 3.1 |

The 1960 grab sample of the Specialty Mill effluent was taken after the effect of cleaning machine number 9 had passed through the sewer. Thus it represents, more closely, the normal sewer loss than does the composite sample which includes the high waste loading caused by cleaning the machine.

## DISCUSSION OF ANALYTICAL RESULTS

The analyses of the main effluent streams from the Specialty and Board Mills are summarized below to assist in the discussion. The results from the eight hour composite samples are used since they are more representative, except for solids on one of the samples. Because of the unusual loss of solids for a few hours on the day during which sampling occurred in 1960, the figures for the grab sample at the Specialty Mill are used in place of those for the composite sample.

Analyses in parts per million

| | Specialty Mill | | Board Mill | |
|---|---|---|---|---|
| | 1960 | 1963 | 1960 | 1963 |
| 5-Day B.O.D. | 100 | 122 | 46 | 44 |
| Solids - dried, suspended | 342 | 426 | 346 | 316 |
| - loss on ignition suspended | 140 | 170 | 248 | 256 |
| pH | 5.4 | 5.8 | 5.6 | 6.3 |
| Acidity | 20 | 14 | 10 | 12 |
| Phenol equivalents (parts per billion) | 15 | 90 | 25 | 10 |
| Nitrogen | | Insignificant | | |

This effluent, considering concentrations only, would be quite acceptable at a municipal sewage treatment plant. However, the cost of transporting 5-1/2 million gallons per day through sewers for a considerable distance to a municipal treatment plant would be considerable and uneconomical.

Biochemical Oxygen Demand

The 5 day B.O.D. of the two wastes streams at 120 and 44 parts per million exceeded the recommended limit of 20 ppm. for discharge to a natural watercourse. The biochemical oxygen demand of the waste stream is exerted by dissolved carbonaceous organic substances from the presence of small quantities of such materials as starch, dyes, urea formaldehyde, rosin size, emulsified wax or disinfectants. B.O.D. is also contributed to a lesser degree by fibre or cellulose which, on decomposing, exerts a slow oxygen demand. The concern for fibre in a waste effluent is its tendency to deposit and accumulate in stream beds and this factor is better represented from the analyses of ignited suspended solids.

Although still more effective solids separation would assist in decreasing the 5-day B.O.D., the bulk of the oxygen requirements for the paper mill wastes comes from the dissolved organic substance, and in any program directed at lowering the 5-day B.O.D. of the waste effluent, this consideration should receive preference.

Solids

The figures for dried suspended solids represents the material, after evaporation of the water at 103° centigrade, which would either float or be in suspension in the waste effluent.

The determination of suspended solids by evaporation may be of limited value for estimating the effect of the effluent on the receiving water because of current and velocity characteristics of the stream, unless gross concentrations were indicated. Solids determinations are useful as a control in monitoring waste streams and pretreatment facilities.

The volatile suspended matter represents the dried suspended matter which is volatilized in a furnace at 600°C. It is assumed that the bulk of the volatile matter, from paper machine wastes, represents the amount of fibre and can therefore be interpreted as an approximation of the fibre content. In this respect, the Specialty Mill effluent contains suspended solids which are about 40 per cent fibre and the Board Mill suspended solids which are 80 per cent fibre. The difference in fibre content is accounted for by the greater amounts of fillers and clays used in Specialty paper.

## The E. B. Eddy Company

### pH

It is recommended that the pH of an industrial effluent to a natural watercourse remain between 5.5 and 9.5. Both E. B. Eddy Company outfalls are at the bottom of this range in pH.

### Acidity

The small concentrations of acidity in the effluents together with a pH of about 5.5, indicate the very limited presence of weak acids or acid salts.

### Phenol

The phenol equivalents analyses represents those hydroxy derivatives of benzene which can be determined by the Gibbs or 4-Amino antipyrine methods. The Gibbs method was used for these analyses. The presence of phenol or any of its equivalents is limited to a maximum of 20 parts per billion because of its pronounced effect on fish and water quality. The phenol concentrations of the two outfall sewers were very close to the recommended limit and the average concentration of the two outfalls combined was below 20 parts per billion in 1960. The 1963 results show a decrease in the Board Mill sewer and an increase in the Specialty Mill sewer.

Considering the day to day variation in sewer loading, the calculated waste loadings in this report agree quite well with the average values taken from plant records.

The plant records also indicated practically no change in the Specialty Mill sewer between 1960 and 1963, while losses from the Board Mill decreased 40 per cent.

## The E. B. Eddy Company

### REMARKS

The mills of The E. B. Eddy Company located in the city of Ottawa do not produce as concentrated a waste as that from such operations as cooking and bleaching whichare carried out at the Hull mill. The Ottawa Mill effluent contains material consisting of mostly finely suspended pulp fibre and inorganic fillers, mainly clays.

The volume of industrial waste from the plant, 5-1/2 million gallons per day, is too great a quantity to consider for discharge to a sanitary sewer and treatment at the municipal plant.

The E. B. Eddy Company was found to be sincere in their effort to combat pollution and had already installed much equipment for settling, screening, recirculation and monitoring the waste flows. New processes were being considered to reduce the waste flows, and the company was quite active in the co-operative study by the pulp and paper mills in the Ottawa Valley, which had organized to co-ordinate their spending in pollution control.

It is suggested, therefore, that The E. B. Eddy Company continue to discharge the industrial effluent to the Ottawa River with a view toward approaching effluent standards which would meet the Objectives for Water Quality in the Province of Ontario.

# THE ALEXANDER FLECK LIMITED

The Alexander Fleck Limited operates a plant at 75 Spencer Street for the manufacture and service of heavy machinery for the pulp and paper industry. These products include such machines as pulp refiners. The plant employs 70 people and uses 3,400 gallons of city water per day.

There are no wet processes in this plant. The main plant operation is machining. The only industrial waste water discharged from the plant is cooling water used on a compressor. Plant wastes are discharged to the combined city sewers.

## INSTRUMENTS (1951) LIMITED

Instruments (1951) Limited operates at 300 Parkdale Avenue selling and servicing surveying equipment, and controls and instruments for the Air Force. The plant employs 40 people. City water is used by the plant (6,200 gallons per day) for sanitary purposes and in a small cafeteria.

At one time the plant operated a small machine shop. After November 1, 1960 the industry moved into smaller quarters in the Continental Paper Company Building on Booth Street and the machine shop operations were discontinued.

This plant discharges no industrial waste.

## THE JOURNAL PUBLISHING COMPANY (OTTAWA) LIMITED

The Ottawa Journal is published by the Journal Publishing Company at 233 Queen Street. The building has 376 employees including tenants and newspaper personnel.

The daily water consumption is 9,300 gallons of city water, and of this quantity, only 4,000 gallons per day is for the industrial purposes of cooling and boiler water make up. Cooling water used on compressors, linotype and stereotype machines is recycled.

The only industrial waste waters discharged from this building are uncontaminated cooling waters.

# LADROIT PUBLISHING COMPANY

LaDroit Publishing Company prints a daily newspaper at 375 Rideau Street. The plant employs 243 people and has a daily water consumption of 11,200 gallons.

The industrial water used is cooling water for six compressors, linotype and stereotype machines.

Since cooling water was recirculated the daily water consumption has decreased from 21,000 in 1960 to 11,200 gallons per day.

The only industrial waste discharged is cooling water.

## O'KEEFE BREWING COMPANY LIMITED

### Ottawa Division

This brewery at 840 Wellington Street, Ottawa was investigated as part of the Industrial Waste programme of the Water Resources Survey at Carleton County. The purpose was to determine the characteristics, strengths and volumes of liquid process wastes presently being discharged to the municipal sewers and to make recommendations for acceptance of the waste into the sewerage system after completion of a municipal sewage disposal plant by the City of Ottawa.

The brewery was initially surveyed in August 1960 and again in July 1963. The production and water consumption data in this report are for 1963, while the analytical results are for samples taken in 1960.

### PERSONNEL

| | |
|---|---|
| Mr. F. K. Venables | - Division Manager |
| Mr. J. R. Cameron | - Brew Master |
| Mr. W. E. Partridge | - Bottling Superintendent |
| Mr. G. E. Thomson | - Plant Engineer |

By the end of 1963, Mr. N. Smith will be the Plant Engineer.

### OPERATING DATA

This plant, employing 200 people, operates five days per week. The brewing operations continue 24 hours per day and the bottling plant operates 8 or 16 hours per day. Ale and beer are produced at this plant in 6,000 gallon brews. The plant is presently operating at 46 brews per week.

## O'Keefe Brewing Co. Ltd.

The water consumption in the bottling plant varies from 223,000 to 497,000 gallons per day, depending on production, but averages 338,000 gpd. The amount of water used in brewing averages 350,000 gpd, but varies from 244,000 to 417,000 gpd, depending on production and cooling water requirements.

Between 1960 and 1963 production of this brewery has increased approximately 30 per cent. This was accompanied by a corresponding increase in water consumption and sewer loading.

The water consumption, averaged for the first six months of 1960 and 1963 is as follows, calculated as gallons of water used per gallon of beer produced.

| | Brewing | Bottling | Total |
|---|---|---|---|
| 1960 | 7.1 | 7.5 | 14.6 |
| 1963 | 9.0 | 8.1 | 17.1 |

## PROCESS

### Grain Cooker

The mixed grains are cooked for one hour in one of two grain cookers. The second cooker is used very rarely.

### Lauter Tank

The contents of the cookers are cooked an additional 20 minutes to insure that the insoluble starches are converted to soluble starches, and the soluble malt starches to dextrin and malt sugars. The wort is then strained through the insoluble spent grains and sent to the brew kettle. The spent grains are loaded on a truck and sold.

### Brew Kettle

Here the wort is cooked for 1-1/2 hours and the hops are added. This boiling concentrates the wort, sterilizes it, and coagulates some of the protein.

### Hop Separator

The wort is separated from the spent hops by means of a false bottom in the separator. After cooling the wort is pumped to the fermenters.

### Fermenters

The wort is allowed to ferment seven days. During this time, yeast is drawn off three times. The initial draw off contains protein and tannin, the second draw off is kept for starter yeast on the next batch, and the final yeast draw off is wasted. Carbon dioxide, a product of the fermentation process, is collected from closed fermenters, liquified, and stored until needed. After each batch the fermenter is cleaned with sulphuric acid.

### Storage

The warm brew is stored for thirty days, cooled, then stored cold for twenty days.

### Finishing

From the storage tanks the beer is pumped through a filter press to remove any material, such as protein, that precipitated during the storage or aging process. Approximately 6,000 pounds of diatomaceous earth are used each month in the filters.

### Bottling

There are two bottling lines in the bottle shop. Each of these can operate one or two shifts per day, but usually, the daily production is equivalent to one machine two shifts per day. Caustic soak solution is recirculated with mechanical removal of solids (labels, etc.).

## O'Keefe Brewing Co. Ltd.

### Caustic Clean-Outs

After each brew, a caustic cleaning solution is pumped through the equipment in the brewery. This solution is reused during the week and sewered on Friday. About 700 gallons of two per cent caustic is involved.

### Utilities

The boilers operate at approximately 20,000 pounds per hour with 50% returns. Part of the spent cooling water from the wort cooler is used as boiler make-up.

There are approximately ten compressors using from five to ten gallons per minute cooling water. This water is not recycled. Cooling water from the $CO_2$ liquefying system is also sewered after use. Cooling water from the ammonia condensers on the refrigeration system is recycled through cooling towers to which make-up water is added automatically.

### Water Treatment

Water used in brewing is treated in carbon filters for the removal of chlorine.

## WATER USES

The following list is a estimate of the average water use in the brewery (all values in gallons per day).

| | | | |
|---|---|---|---|
| Brewing - | sanitary | 5,000 | |
| | used in the product | 72,000 | |
| | $CO_2$ liquefying system | 5,500 | |
| | boiler make-up | 24,000 | |
| | cooling water make-up | 80,000 | |
| | wash water | 150,000 | |
| | in spent grains | 20,000 | 360,000 |
| Bottling | | | 340,000 |
| Total | | | 700,000 |

## O'Keefe Brewing Co. Ltd.

### SOURCES OF WASTES

#### Grain Cooker

Since the contents of the cooker are dropped to the lauter tank, the waste from the cooker is a small amount of wash water.

#### Lauter Tank

The spent grains are sold wet, thus the sewered waste is water that drains from the spent grains while they are being loaded on trucks, and wash water.

#### Brew Kettle

The contents of this kettle are separated in the hop separator leaving wash water as the process waste from the brew kettle.

#### Hop Jack

After the wort is drained off, the spent hops are sewered with wash water used to clean the hop jack.

#### Fermenters

The wastes are the initial and final draw off of yeast. The initial draw off is approximately 50 pounds per brew and the final approximately 450 pounds per brew. Water is used to wash the yeast out of the fermenting tanks to the sewer. A small amount of sulphuric acid is also used to clean the fermenters.

#### Storage

Wash water is the only waste, and is used to remove the small amount of beer adhering to the inside of the storage tanks, and any sediment that settled during the aging period.

#### Filtering

Approximately 250 pounds of diatomaceous earth are sewered daily.

## O'keefe Brewing Co. Ltd.

### Bottling

Waste in the bottling plant is from the bottling machines. There are two bottling machines, but both do not operate all the time.

### SAMPLING

The plant has several outfalls to the city sewer on Wellington Street, but these are inaccessible. For this reason, samples were taken throughout the plant in order to estimate the amount of waste leaving the plant. The following samples were taken during August 1960.

(a) A grab sample of the liquid dripping from the spent grains.

(b) A grab sample taken from the hop jack while it was being washed.

(c) A grab sample of the initial yeast draw off.

(d) A grab sample of the final yeast draw off.

(e) A four hour composite sample from one of the bottling machines.

### ANALYSIS

The samples were analysed for the following; solids (total, suspended and dissolved), pH, 5-day B.O.D. and nitrogen (kjeldahl, free ammonia, nitrite and nitrate).

## O'Keefe Brewing Co. Ltd.

### RESULTS

With the exception of pH the following results are in parts per million.

| | | Solids | | | | | Nitrogen | | |
|---|---|---|---|---|---|---|---|---|---|
| Source of Waste | 5-Day BOD | Total | Susp. | Diss. | pH | Acidity | Kjeldahl | $NH_3$ | $NO_2$ |
| Hop Jack | 10,000 | 125,752 | 27,062 | 98,690 | 5.4 | 980 | 3,760 | 41 | .05 |
| Bottling Machine | 260 | 356 | 18 | 338 | 6.8 | 34 | 4.5 | -- | 0.1 |
| Initial yeast | 20,000 | 50,212 | 11,474 | 38,738 | 4.5 | 1,780 | 2,020 | 15.6 | -- |
| Final yeast | 58,000 | -- | -- | -- | 5.7 | 3,000 | 1,550 | 20.5 | 0. |
| Grain drippings | 5,100 | 3,660 | 422 | 3,238 | 3.1 | 1,180 | 89 | 3.3 | 0. |

### WASTE LOAD

The following table is an estimate of the amount of 5-day biochemical oxygen demand, and suspended solids leaving the brewery.

| | | 5-day BOD | | Suspended Solids | |
|---|---|---|---|---|---|
| Source of Waste | Amount of Waste | ppm | lb/day | ppm | lb/day |
| Grain cooker washing | | | | | |
| Lauter tank - grain dripping | 18,200 gpd | 5,100 | 926 | 422 | 77 |
| - wash | included above | | | | |
| brew kettle - washing | | | | | |
| hop jack - hops to sewer | 1,230 gpd | 70,000 | 860 | 27,062 | 332 |
| wash | included above | | | | |
| fermenters - initial yeast draw off | 50 lbs.per brew | 20,000 | 8 | 11,474 | 5 |
| - final yeast draw off | 450 lbs.per brew | 58,000 | 214 | 30,000* | 111 |
| - wash | included above | | | | |
| total brewing | 242,500 gpd | 824 | 2,008 | 216 | 525 |
| bottling | 252,855 gpd | 260 | 655 | 18 | 46 |
| brewery total | 495,355 | 538 | 2,663 | 115 | 571 |

* estimated

This method of estimating the waste loading, from inplant samples, is difficult and can be very inaccurate. It was decided not to resample the brewery during the 1963 investigation because of the uncertainty of the sampling method that had to be used.

## DISCUSSION OF RESULTS

Considering the estimates that were made to arrive at the sewer loadings in the preceding table, the results are considered to be low.

The table indicates sewer loadings of less than two pounds of biochemical oxygen demand and just over one-half pound of suspended solids per barrel of beer produced. Average values from other breweries in Ontario give sewer loadings of just under three pounds of biochemical oxygen demand and just under two pounds of suspended solids per barrel of beer produced. These figures include bottling, and also include breweries that recover yeast and do not sewer hops.

Considering the present production at the brewery, the waste loading should be, depending on production, in the following range.

biochemical oxygen demand - 5,000 to 10,000 pounds per day
suspended solids - 2,000 to 4,000 pounds per day

These values indicate that the hypothetical total effluent from the brewery would contain biochemical oxygen demand and suspended solids in concentrations in the order of 1,000 and 500 parts per million respectively.

## CONCLUSIONS

There are no constituents in the waste which are considered toxic to the normal processes in sewage treatment, and the only consideration in the control of brewery waste water discharged to a sewerage system would be the effect of overloading the oxidation processes, such as activated sludge, from the high 5-day biochemical oxygen demand of the waste. If proper provision is made in the secondary sewage treatment plant design, treatment with sewage can usually be accomplished without detriment to the municipal treatment plant. However, the city of Ottawa has much less industrial waste, as compared to domestic waste, than other cities in Ontario. For this reason, the waste from this plant mixed with the city sanitary sewage would receive sufficient dilution so that it would have no detrimental effect on a sewage treatment plant. Considering this, the city of Ottawa should decide whether or not to accept this brewery waste into its sewers after a secondary sewage treatment plant has been built.

Should the city not accept this waste, the plant could reduce its waste load by intercepting spent hops and waste yeast before they reach the sewers. These changes would greatly reduce the biochemical oxygen demand and suspended solids content of the brewery wastes.

Although the results of the nitrogen analyses are numerically high, the hypothetical total effluent from the plant would contain very little available nitrogen, not enough to keep BOD to nitrogen ratio at 20:1 which is required for the secondary sewage treatment processes. Since there are no other industries in Ottawa discharging high BOD wastes, the normal excess of available nitrogen in sanitary sewage may make-up the deficiency in the brewery waste.

## O.P.W. PAINTS LIMITED

The above company operates a plant at 687 Wellington St., where enamels and a small amount of varnish and water base paints are produced. The plant employs 33 people and uses 18,700 gallons of city water daily. The water consumption varies between 8,000 and 30,000 gallons per day depending on production and cooling water needs.

The plant operates five days per week and one shift per day.

Cooling water is used in the jackets of the pigment ball mills, in a compressor, and is not recycled. The only contaminated waste discharge is the small amount of water used for washing the equipment used in the production of water base paint. The equipment used on the non-water base paint is cleaned with solvents which are not sewered but are collected and shipped to Montreal for recovery.

The waste from this plant contains a large amount of uncontaminated cooling water, and contains no constituents that would be harmful to a sewage treatment plant.

## SPARTAN AIR SERVICES LIMITED

This company operates a laboratory for developing and printing photographs at 348 Queen Street. They employ ten people. The daily water consumption is 7,500 gallons of city water. The company operates one shift, five days per week.

Because the operations are developing and printing photographs, the waste leaving the plant is approximately 14 gallons of spent developer, fixer, etc., diluted with nearly 7,500 gallons of wash water daily.

The waste waters from this plant will cause no problems in the operation of a municipal sewage treatment plant.

## SPERRY GYROSCOPE OTTAWA LIMITED

This company operates a plant a 3 Hamilton Ave., employing 125 people for the assembling and servicing of parking meters and aircraft instruments. The plant uses 7,200 gallons of city water daily, and operates one shift, five days per week.

### PLANT OPERATION

After the instruments are repaired the old paint is stripped off and the instrument is repainted. Sewered waste from this process is a hot water rinse after the stripping operation and cooling water from a vapour degreaser. This operation is very small because the size and number of instruments painted is small. The plant also uses water for boiler feed and for cooling two compressors and a vacuum pump.

The waste from this plant contains a large amount of uncontaminated cooling water. This waste can be discharged to the municipal sewerage system with no resulting problems.

## SUN TUBE CORPORATION OF CANADA LIMITED

The Sun Tube Corporation employs 134 persons at 145 Spruce Street, and produces metal tube containers for cosmetics such as tooth paste, shaving cream and hair tonic, containers for deodorant, detergent, table syrup and insectides and tube caps of bakelite and polyethylene. The company also merchandizes plastic tube and squeeze bottles for detergents, flea powder and cosmetics.

Mr. H. A. Coulman, Plant Manager and Mr. W. R. Morgan, Assistant Accountant were interviewed. Some of the raw materials are lead, zinc, aluminum alloy, enamel and printing ink.

The production units consist of an aluminum smelting oven, rolling, and injection moulding machines.

The quantity of water used averaged 18,200 gallons per day. The use of water was mostly for cooling of the production machines, unit heaters, and air conditioning.

All waste cooling waters and sanitary wastes were discharged to the municipal sanitary sewer on Spruce Street, in the same quantity as the water consumption.

The building was situated over a spring and it was necessary to collect in a sump, the water which seeped into the basement level and pump it to the sanitary sewers.

The effluent from this plant can be safely discharged to the city sanitary sewer.

## THOMAS SUPPLY AND EQUIPMENT COMPANY LIMITED

This industry, employing 200 persons, eight hours per day, five days per week produced cosmetic preparations with a number of brand names at 1451 Coldrey Avenue.

An interview was held with Mr. R. O. Sully, Chief Chemist and Plant Manager, who provided a tour of the plant to indicate the processes involved in manufacturing.

The raw material used for the preparation of the numerous products were soaps, detergents, emulsifying agents, oils, fats, waxes, perfumes, and solvents such as acetone, alcohol and formaldehyde. Approximately 2,000 items were used as raw materials.

The quantity of municipal water consumed per year was 1,677,936 gallons or about 5,600 gallons per day. The use of this water was broken down by Mr. Sully as about 50% for cooling, 25% for process and 25% for domestic use which included a cafeteria.

All process water was passed through a deionizing unit with a capacity of 200 gallons per hour.

Waste waters were produced only during wash up periods. This occurred during flushing and cleaning of vessels used for blending. Much of the equipment received a formaldehyde scrubbing once per month for bacterial control and parahydroxybenzoate was also used as a preservative.

Mr. Sully synthesized a representative sample of all the materials which could possibly reach the sewers during clean up periods. The analytical results were as follows in parts per million unless otherwise indicated.

Thomas Supply and Equipment Co. Ltd.,

| | | |
|---|---|---|
| 5-day Biochemical Oxygen Demand | | 3600 ppm |
| Solids | - total | 1066 ppm |
| | - suspended | 410 ppm |
| | - dissolved | 656 ppm |
| pH | | 8.5 units |
| Alkalinity | | 126 ppm |
| Anionic Detergent (as Manoxol O.T.) | | 40 ppm |
| Ether Solubles | | 560 ppm |

Most of the water used in the process remained in the product and the quantity of waste wash up water represented only a small proportion of the total water sewered.

The large volume of cooling water should provide sufficient dilution to reduce the 5-day biochemical oxygen demand to the recommended limit for an industrial effluent of 300 ppm and the suspended solids to 350 ppm.

All wastes discharged to the municipal sanitary sewers.

Manufacturing or process operations occupied only a small part of the space in the building which was utilized mainly for warehousing and filling operations.

## THE VICTORIA FOUNDRY COMPANY LIMITED

This company employs 30 people in its plant at 40-44 Booth Street. The plant uses 5,000 gallons of city water daily in the production of castings.

No contaminated industrial waste is discharged from this plant. The waste that is discharged is cooling water from a compressor.

The plant operates one shift per day, five days per week.

## APPENDIX I - (b)

## INDIVIDUAL INDUSTRIAL REPORTS FOR THE TOWN OF EASTVIEW

List of Industries:- Page

Allied Paper Products Limited .................... 60

Betcherman Machinery Limited ..................... 61

Betcherman Iron and Metal Company Limited ........ 61

Capital Carbon and Ribbon Company Limited ........ 62

McKay Smelters Limited ........................... 61

National Grocers Company Limited ................. 63

## Water Consumption Data for Industries
## in the Town of Eastview

| Industry | Gallons per year |
|---|---|
| Betcherman Iron and Metal Co.<br>including - Betcherman Bros.<br>and MacKay Smelters | 1,544,462 |
| Bond Brass Ltd. | 242,362 |
| Capital Carbon and Ribbon Co. Ltd.<br>including Allied Paper Products Ltd. | 1,154,562 |
| Dominion Bridge Co. Ltd. | 2,308,114 |
| Harry Hayley and Sons Ltd. | 1,686,547 |
| National Grocers Co. Ltd. | 9,427,018 |
| Ottawa Iron Works Ltd. | 709,987 |
| Twin City Dunbrick Co. | 1,415,794 |
| Total gallons per year | 18,490,000 |

Average gallons per day = 60,000

# ALLIED PAPER PRODUCTS LIMITED

This firm is located in a building owned by Capital Carbon and Ribbon Company Limited at 120 John Street and employs a total of 65 persons.

Mr. H. C. Whiteside, the President, was interviewed.

The operating schedule at the plant is seventeen hours per day, five days per week with very little seasonal variation.

The products are wax paper and paper bags and the operations producing liquid waste are chilling of the waxed paper and washing of glue pots. Refrigerated water at 50°F is used for the two chilling machines, and a reservoir is used to provide recirculation of the water. This water is discarded about every two months to the road culvert and was estimated to be about 10,000 gallons.

The water used by Allied Paper Products passed through the same meter as used by Capital Carbon and Ribbon Company and therefore no distinction could be made in the quantity of water used by both firms. An estimate was made by Mr. Whiteside, the President, that 60,000 gallons of water per year was used for chilling purposes.

The effluent of industrial cooling water was considered uncontaminated and was discharged to a natural watercourse. The remaining plant wastes were discharged to the municipal sanitary sewer.

## BETCHERMAN IRON AND METAL COMPANY LIMITED

## BETCHERMAN BROTHERS

## McKAY SMELTERS LIMITED

For financial reasons the company is divided into three groups with the actual production taking place under the name McKay Smelters, at 20 Charlevoix Road. The total number of employees in the three companies is 50, and the total water consumption is 6,000 gallons per day. McKay Smelters produce brass ingots.

The plant uses water for sanitary purposes, boiler feed make-up, cooling a compressor which runs only when the furnace is operating, and cooling the brass ingots. To cool the ingots, water is sprayed directly onto them, causing much of the water to vaporize. The unvaporized portion flows to the plant sewer.

### Conclusion

The wastes from this plant will cause no problem in a municipal sewerage system.

## CAPITAL CARBON AND RIBBON COMPANY LIMITED

The operations at this plant are paper converting for the production of typewriter ribbons, teletype rolls and carbon paper.

Mr. R. Lewis, Secretary-Treasurer was interviewed.

The plant operates 18 hours per day, five days per week with a total of 75 employees including those from Allied Paper Products who are tenants in the building at 120 John Street.

The total water consumption was 1,154,500 gallons per year and included that used by Allied Paper Products. Capital Carbon and Ribbon used an estimated one-third of this quantity.

Water was used from a recirculation system for chilling wax after application to paper. The reservoir of water in this system was drained every two months.

The building was served with sanitary sewers and roof and land drainage was directed to low land.

The only process waste discharged from the plant was uncontaminated cooling water.

# NATIONAL GROCERS COMPANY LIMITED

This company operates a plant employing 90 people at 140 Jeanne Mance Street for the packaging and distribution of wholesale groceries. The plant uses 26,000 gallons of water daily from the municipal supply. Although the plant operates one shift five days per week, the water use is continuous.

## PLANT OPERATIONS

During December and January some vegetables are washed at this plant, but during the rest of the year the fruit and vegetables are imported already washed and inspected, thus the plant has only to redistribute the produce. The large amount of water used by this plant is cooling water used in the ammonia refrigeration system which is used to chill the storage rooms. The cooling water is not recycled.

## CONCLUSION

The only waste from this plant is uncontaminated cooling water except in December and January when some wash water is discharged.

## APPENDIX I - (c)

## INDIVIDUAL INDUSTRIAL REPORTS FOR NEPEAN TOWNSHIP

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## COMPUTING DEVICES OF CANADA LIMITED

An industrial waste survey of the waste disposal practices of this firm was carried out by the Industrial Wastes Branch in 1957 and 1958 as part of their regular duties of industrial waste control. The information collected in 1960 and 1963 provided an up-to-date picture of the methods of waste disposal.

The plant operates eight hours per day, five days per week, employs 1,000 persons, and produces computing devices and aircraft instruments. Mr. J. G. Stone was interviewed.

Water is supplied from a 160 foot drilled well at the front of the property. This well has a maximum capacity of 2,000 gallons per hour. A second well at the rear of the property was drilled in July, 1960. This well servicing the rear building, is about 200 feet deep and gave a test capacity of 2,400 gallons per hour.

The consumption of water from both these wells was estimated to be about 60,000 gallons per week. The uses were for air conditioning which includes a recirculation tower, for a cafeteria and other domestic purpose, boiler, lawn watering for a large area and process water. Domestic wastes were discharged to a septic tank and tile bed system, and some to the Nepean Township sewage treatment plant.

The use of process water was on a small scale and included that for a small photo development section and for a laboratory scale plating department.

No liquid waste discharged from the main building of CDC and only a small flow from building No. 2. This entered a common drain of CDC and the former building of McGlashan Silverware Limited now used as a furniture market.

## Computing Devices of Canada Limited

The analytical results of a sample taken from this flow, plus the results of a sample, after being diluted by the main flow in the sewer, are listed below.

1. Effluent from No. 2 building CDC

| | |
|---|---|
| 5-day BOD | 74 ppm |
| solids - total | 560 ppm |
| - suspended | 38 ppm |
| - dissolved | 522 ppm |
| pH | 6.4 |
| alkalinity | 90 ppm |
| cyanide | 0 ppm |

2. Combined effluent - CDC and McGlashan Silverware building

| | |
|---|---|
| 5-day BOD | 20 ppm |
| solids - total | 476 ppm |
| - suspended | 22 ppm |
| - dissolved | 454 ppm |
| pH | 7.0 |
| alkalinity | 188 ppm |
| cyanide | 0 ppm |

The previous investigations at this plant revealed that the methods of process waste disposal were satisfactory. The above analyses again confirm that an effluent suitable for discharge to a natural watercourse is being produced.

## NORTHERN ELECTRIC COMPANY LIMITED

Northern Electric Company Limited have established laboratories for research and development at Constance Bay (Crystal Bay) in Nepean Township. At present there are two buildings, and provisions were made for two more laboratories.

The operations are one shift per day, five days per week with 440 employees. Mr. W. J. Horton, Superintendent of Laboratory Services was interviewed.

### WATER SUPPLY

Water is obtained from two drilled wells, 212 and 140 feet deep with test capacities of 110 and 60 gallons per minute. Most of the water used is treated by sand and carbon filters, lime and copperas coagulation and demineralization using two single and one mixed bed unit. Regeneration of the demineralizer occurs two or three times a week, and consumes 90 pounds of muriatic acid and 60 pounds of caustic for each regeneration.

### WASTE DISPOSAL

Sanitary wastes, cooling water and the small amount of laboratory wastes (all plant wastes) are pumped to a municipal sanitary sewer leading to the Nepean Township sewage treatment plant.

### CONCLUSION

These wastes seem acceptable for municipal treatment since no operating problems have been reported from the Nepean Township sewage treatment plant.

# APPENDIX II

## INTERPRETATION OF ANALYTICAL RESULTS

All analytical results are reported in parts per million (ppm) with the exception of pH, phenolic equivalents, turbidity, bacterial analyses and a few specific tests. One part per million is equivalent to one milligram per litre or to one pound per hundred thousand Imperial gallons.

The following is a brief description of the more common analyses used in pollution control.

### Biochemical Oxygen Demand - (BOD)

This test is the most common one. It measures the amount of oxygen needed to stabilize the organic material in a waste in five days under standard laboratory conditions. Normal sanitary sewage usually contains 200 ppm BOD. The suggested limit on the discharge of wastes to storm sewers or natural watercourses is 20 ppm. This is to protect the receiving water by maintaining a reasonable dissolved oxygen content.

### Suspended Solids

These are solids that float, settle, or are held in suspension and can be removed by laboratory filtration. Sanitary sewage and industrial wastes are significant sources of suspended solids, and normal sanitary sewage contains up to 300 ppm. The suggested limit for the discharge of wastes to natural watercourses is 20 ppm. This is to prevent unsightly conditions and the deposition of material in streams that could interfere with navigation and injure the habitat of fish.

## Hydrogen Ion Concentration - (pH)

This is a logarithmic interpretation of the hydrogen ion concentration. It is reported in numbers from zero, very acidic to 14, very basic. The discharge of all wastes should be in the range 5.5 to 9.5. Outside these limits corrosion and scale deposits become significant and the operation of a sewage treatment plant becomes difficult. While pH measures the instantaneous activity of the hydrogen ion, acidity and alkalinity determinations include the buffering action of the waste constituents. The optimum pH for an activated sludge sewage treatment process is just under 8.

## Nitrogen

The nitrogen analysis performed are free ammonia, Kjeldahl, nitrite and nitrate. These analyses offer an indication of the treatment or oxidation of organic wastes, since the nitrogens are converted to nitrites and finally nitrates as sewage treatment proceeds. Nitrites and nitrates are not usually found in unpolluted water supplies or sanitary sewage but are present in the effluent from a secondary sewage treatment plant.

## Grease and Oil

These are determined as ether solubles. Grease and oil present an offensive condition on surface water, adversely affect the operation of a sewage treatment plant, and can coagulate and block sewers. The discharge of wastes to natural watercourses should not contain more than 10 ppm determined as ether solubles.

## Phenol Equivalents

These include hydroxy derivatives of benzene that are detected by the Gibbs or aminoantipyrine methods. The results are reported in parts per billion (ppb). Small quantities of phenol or equivalent (one or two ppb) can cause a medicinal taste in water especially if the water is chlorinated. Wastes discharged to natural watercourses should not contain over 20 ppb.

Metal Ions

Metal ions such as copper, cadmium, chromium, zinc, etc., are toxic to aquatic live at varying concentrations. The discharge of these wastes to a natural watercourse is limited by the toxicity of the metal ion. Similarly the toxicity of the metal ions to sewage treatment processes limits their discharge to municipal sanitary sewers.

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